

Simultaneous tibial osteotomy and total knee arthroplasty in posttraumatic and obese patient: case report

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Abstract—Deforming osteoarthritis of the knee joint alters the mechanical axis of the lower limb. This, combined with extra articular deformity of the tibia or femur leads to serious dysfunction of the limb and great disability for the patient. These rare cases present great challenge for the orthopedic surgeon. Most of the cases with mild to moderate deformities can be successfully managed by adjusting intra articular resections, but in those with severe extra articular deformity, an extra articular correctional osteotomy may be required in order to achieve good flexion-extension balance of the knee. We report a case of total knee replacement performed together with correctional osteotomy of the tibia due to extra articular deformity of about 20 degree varus.

Keywords—total knee replacement, extra articular deformity, osteotomy, varus knee, single stage, simultaneous.

1 Introduction

Advanced deforming osteoarthritis of the knee joint is common indication for total knee arthroplasty. These patients usually have bad range of motion, persistent pain and poor quality of life. Surgery is their only option to regain same mobility. Treatment of gonarthrosis imposes a significant economic burden on populations of industrialized countries due to increasing life expectancy and intolerance of pain and disability^{1,2}. During surgery restoration of the mechanical axis of the limb is mandatory. Coronal

alignment is a key factor in knee replacement surgery, both preoperatively to describe the deformity and postoperatively to assess correction¹.

Most common deformity in coronal plane is the varus knee. Usually, varus is intra articular and correction is made intraoperative by adjusting the resections. However, in some cases an extra articular deformity of tibia or femur is present and this deformity also alters the mechanical alignment of the limb. Causes of extra-articular deformity of the femur and tibia are numerous and can lead to varying degrees of deformity³. Specific causes include metabolic bone diseases, congenital abnormalities, posttraumatic malunion, and previous osteotomies⁴. Fracture malunion of the femur and/or tibia, one of the most common causes of extra-articular deformities around the knee⁵.

Extra-articular deformities of the femur and tibia in conjunction with advanced knee osteoarthritis pose unique challenges for the arthroplasty surgeon³. In these cases, mechanical alignment cannot be achieved only by performing more “generous” intra articular resections, for this would interfere with soft tissue structures and ligamentous function. Excessive bony resections may also require higher constrained implants. Staged or simultaneous osteotomy combined with arthroplasty is beneficial in these severe cases.

Performing one-stage osteotomy combined with total knee arthroplasty is a rare procedure, not well described in the literature and to some degree with uncertain indications. The largest reported group consist of 21 patients⁶, and the others are with less⁷. There are also some single case reports⁸.

2. Case report

Presented is a case of a 72 years-old female patient, who suffers from severe pain and limited range of motion of both knees. Complains of stiffness and instability of the right knee. Right tibia had previous operation due to a fracture, 12 years ago (*Fig. 1*).

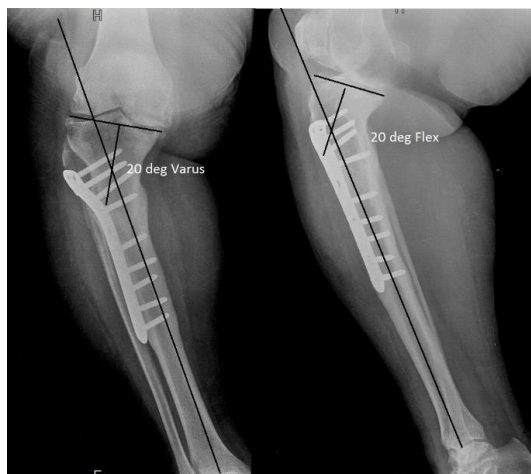


Figure 1. Osteosynthesis with malunion in 20° varus and 20° flexion and advanced osteoarthritis.

The patient is diagnosed with advanced osteoarthritis, Kellgren and Lawrence stage IV⁹ and extra articular deformity of the tibia, due to malunion in 20° varus and 20° flexion.

The presence of a metal osteosynthesis, together with some general medical conditions of the patient such as obesity (BMI>35) and diabetes type II are considered as serious risk factors for postoperative infection¹⁰. Therefore, the plate was removed in separate procedure in order to reduce the operation time during the arthroplasty and to minimize the risk of infection (Fig. 2).

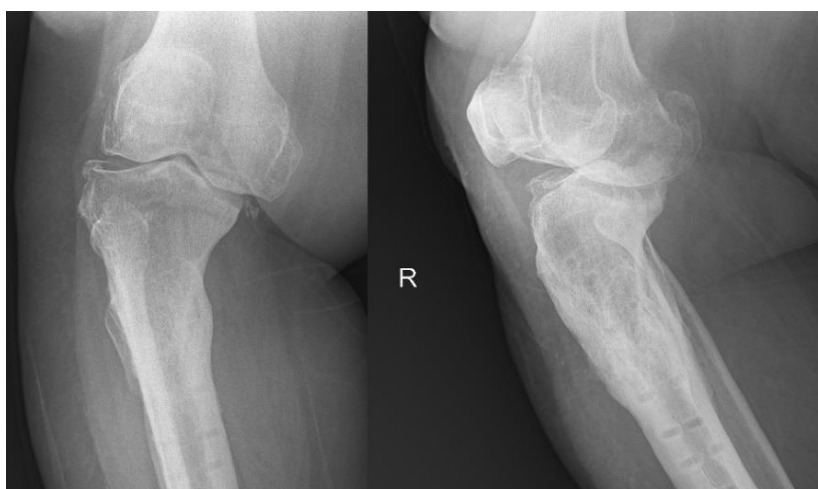


Figure 2. Implant removal. Extra articular varus deformity confirmed.

Optimization of diabetes was done prior to the arthroplasty and recommendation for weight loss was given, but failed to achieve.

Simultaneous osteotomy of the tibia accompanied by total knee arthroplasty is performed 6 months after plate removal. We use a standard parapatellar approach, extended distally and laterally, for the needs of the osteotomy. Anterolateral closed-wedge osteotomy at the level of the extra articular deformity of the tibia is performed in order to correct both varus and flexion deformity. The correction is done and the osteotomy is reduced and temporary fixed with plate and 2 screws in order to maintain reduction. Special care should be taken, when positioning the first two screws, in order not to obstruct the intramedullary canal of the tibia.

Regarding intra articular resections for the total knee arthroplasty, we use the standard operative technique described by the manufacturer of the implant. We use extension-gap first technique to avoid excessive bone resections. After the distal resection of the femur, the intramedullary canal of the tibia is reamed with 1 mm increment reamers until good cortical contact. After that, resection of the tibia is done and the extension gap is checked. The ligaments are assessed as fully intact and posterior-stabilized implant is chosen as level of constrain. After the additional reaming of the tibia, the resections are completed in a standard manner.

After cementation of the implant, we insert more screws through the plate in order to maintain rotational stability of the osteotomy. Axial stability of the osteotomy is provided by the long stem of the tibial component.

Operation is performed with tourniquet only during cementation. Operation time is 1 hours 40 minutes. Blood loss 800cc. Standard use of tranaxemic acid. No use of intra articular drainage. Standard antibiotic prophylaxis with cefazolin¹¹.

Postoperative radiographs are taken and the position of the implants is checked. Good alignment of the knee and restoration of the mechanical axis of the tibia and knee are observed. (*Fig. 3*).



Figure 3. Postoperative radiographs: good alignment and correction are observed.

The wound is checked regularly for secretion and sings of infection. Sutures are removed on 14th day after operation. Follow up at the time of writing is 10 mounts. Regular visits are taken every 2 mounts. On 2nd postoperative mount radiographs the osteotomy of the tibia has signs of bone union with no loss of reduction (*Fig. 4*).



Figure 4. Second month after operation. Signs of bone union. Good alignment.

No clinical and laboratory signs of infection were observed during the first 10 mounts. Soft tissues recover completely (*Fig. 5*). Evaluation of the clinical outcome was recorded using Modified HSS Knee score¹². It shows improvement from 34 points preoperatively to 54 point in the early postoperative period. On 2nd postoperative mount HSS Knee score is 65 points, but did no further improvement in the mounts afterwards. This, combined with the improved quality of life, can be considered very good clinical outcome.



Figure 5. Soft tissues follow up: a) 7th day after operation; b) 15th day after operation - sutures removed; c) 20th day after operation; d) 60th day after operation with 90° flexion.

3. Discussion

Cases combining advanced osteoarthritis of the knee and extra articular deformity either on the tibia, femur or both are complex and challenging. They require surgeons to have beyond regular expertise and deep knowledge in the field of lower limb biomechanics. The main goal during surgery is to recover the alignment of the lower limb as close as possible to the mechanical axis. In cases with severe extra articular deformity an additional osteotomy may be necessary prior or together with the knee arthroplasty. Indications for this accompanying procedure are not clear, but majority authors consider 15-20° of deformity as border line above which an osteotomy is a mandatory^{3,5,7,8}. The choice between multi or single stage procedure depends on surgeon preference and on some patient specific factors.

Performing single-stage osteotomy and knee arthroplasty has the advantage of quicker recovery and faster function improvement of the knee. But it is also associated greater risk for complications such as infection, nonunion, higher blood loss etc.

The fixation of the osteotomy is done only for rotational stability, while the stem of the tibial component provides the axial stability. Level of constrain depends on the condition of the collateral ligaments and should be as less as possible.

4. Conclusion

Although total knee arthroplasty is a powerful procedure, used to restore knee alignment, stability and function, its powers are limited to intra articular deformities. Some mild extra articular deformations of tibia and femur can be successfully managed by total knee arthroplasty alone, especially those that are more distant from the knee. Severe extra articular deformities, more than 15-20°, around the knee require a combination of correctional osteotomy and total knee arthroplasty, in order to avoid excessive bone resection, which on their hand lead to ligamentous insufficiency. Both procedure can be performed simultaneously as a single-stage surgery.

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